SELECTED BLACKLEG OUTBREAKS AND THEIR RELATION TO SOIL EXCAVATION

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BLACKLEG DUE TO *Clostridium chauvoei* is an unreliable disease; even in enzootic areas, it may fail to appear even if vaccination is neglected for one or several years. In other situations, the disease may suddenly appear on premises where it has never been known to exist or has been absent for many decades. This report describes situations where the disease first appeared or reappeared after a long absence on premises where excavations were made in areas utilized by cattle.

LITERATURE REVIEW

From the available evidence, the blackleg organism resides in the soil, water, and the viscera and alimentary tract of many living and dead animals. Minnett and Dhanda (7) studied *C. chauvoei* in experimental soil preparations and concluded that little, if any, growth appeared in either sterilized or natural soil. Mulhern (8) believed that the decaying carcasses of blackleg victims permitted the organism to persist in soils for long periods. Kovalinko (5) by monthly culture and animal tests demonstrated that *C. chauvoei* persisted for a 17 month period in loam soil near Moscow.

Raducanescu and Bica-popii (11) demonstrated that survival of *C. chauvoei* in soil depended upon the soil type, among other factors. In the better soils, the organism was recoverable at 11 years, whereas it survived for only two years in soils poor in inorganic matter. In their experiments soils having pH below 7.0 or above 7.5 appeared to have a detrimental effect on survival. The presence of *C. chauvoei* in aquatic habitats is likewise well established. Nasr (9) demonstrated blackleg bacillus in river water near Geissen, Germany.

Prevot *et al* (10) and Carrere and Roux (2) have described disease outbreaks in fresh water fish due to blackleg bacillus, and Lobry (6) mentioned blackleg in hippopotamuses.

Clostridia organisms not only travel by water and soil, but Blanco and Rajaonarison (1) mentioned isolation of *C. chauvoei* from the feces of Madagascar buzzards 96 hours after feeding on blackleg carcasses. Stomatin and Ungureanu (14) cite Sako (12) as stating that the hematophagous arthropods such as tabanids are capable of blackleg transmission.

Feedstuffs likewise may contain blackleg organisms. Stenberg and Estola (13) isolated *C. chauvoei* from liver meal of Argentina origin and doubtlessly other sources exist. Although a recent study on the clostridia present in silage (3) failed to reveal *C. chauvoei*, the use of trench silos often results in a certain amount of soil contamination as a consequence of surface drainage and the tendency to use heavy equipment to remove the silage.

Further studies of the external habitats may yield more information regarding *C. chauvoei* species and preferred locations. They may also explain its sudden, costly and entirely unexpected appearance in premises and regions where the disease has never appeared in recognized form or has been absent for decades. Higginson (4) reports a bovine blackleg outbreak in a hitherto unaffected premise after a ditch draining a neighboring swamp was dug through the cattle pasture. The following series of cases also represent similar outbreaks following the movement of soil in the barnyard or pasture occupied by cattle.

CASE I

A well-managed southwestern Montana premise had a shallow barnyard slough which was converted into a small pond by excavating its center and using the excavated soil to build the banks inwards. In autumn months, a ditch was dug to convey this pond water through the feeding yard in which forty registered Shorthorn cattle were maintained. Several months later, a nonvaccinated three month old intact male Shorthorn was found dead. From the tissues of this calf, *C. chauvoei* was isolated in pure culture. Immediately all young stock were vaccinated for blackleg, but, because all older cattle had been vaccinated at least once as yearlings, the older cattle were not vaccinated. Five days after the calf's death, its 1600 pound, five year old Shorthorn dam

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was found prostrate with crepitant gluteal swelling and an expiratory grunt. In spite of excellent veterinary management, she died two days later with classical blackleg lesions. Cultures of her tissues yielded *C. chauvoei*, as had antemortem blood cultures and antemortem aspirated gluteal lesion exudate. The owner stated that the premise had lost some animals from blackleg three decades ago, but since then had experienced very few losses of any kind and none that was unexplained.

Case II

A north central Minnesota premise of 200 low-lying acres, originally a home farm, had been used for pasture for young stock, miscellaneous beef animals and dry cows owned by various relatives of the original home farm family. The acreage was brushy, low flat canary grass pasture with open glades and a park-like poplar forest. It had a small creek which was not always reliable in dry years. Consequently, in late summer a small pond was dug with a dragline. The pond was approximately 50 feet in diameter and located at the edge of a cattail and willow swamp which extended several hundred feet into an open glade. Shortly after this excavation, a 650 pound Holstein heifer was found dead. In the following spring, 95 head of cattle ranging in age from three months to five years were placed on the pasture. During August (when presumably drier weather caused the cattle to use the excavated pond as a water source), eight head of cattle died. Most of these were found dead in the vicinity of the waterhole, while a few were found still alive but terminal. These included a 900 pound, two year old Holstein heifer, three 300 pound nursing Holstein steers, one very fat three year old Jersey cow heavy with her second calf, and a 500 pound fourteen month old Hereford heifer. Necropsies of one or more of the animals revealed "widespread internal hemorrhages and peritonitis." Poisoning was suspected. In October, a fat 18 month old pregnant Jersey heifer was found dead. It was submitted for laboratory diagnosis and necropsy revealed clostridial peritonitis and myonecrosis. Cultures yielded *C. chauvoei* from brain, spleen and necrotic semimembranosus muscle. The involved region had no known history of blackleg presence and cattle in this area were not vaccinated. The older parent, who still owned the land, stated that he had pastured cattle on this acreage for decades and could not specifically recall summer pasture losses prior to the pond excavation.

Case III

A 1280 acre wooded clay swamp pasture near Lake Superior was used for pasturing 100 beef cows and their calves of various ages. In addition to the pasture grass, the herd was fed bean sprouts and discarded pastry dough from local plants; the herd was in an excellent state of flesh. The owner regularly buried the excess garbage with a tractor equipped for soil moving purposes. Blackleg vaccination had never been practiced because of the absence of known blackleg here. Because blackleg had been unknown in this area, nine four month old calves died within a four week period before blackleg was recognized as the problem. Fluorescent antibody smears were positive for *C. chauvoei* but negative for *C. septicum* and *C. novyi*. Many of the calves had spontaneous "neck-swellings" rather than the more common rearquarter lesions. The owner had maintained cattle on the premise for many decades and had no recollection of pasture losses other than a solitary animal every few years.

Discussion

The above cases suggest (but do not prove) that excavations in cattle pastures are a potential source of a blackleg problem. This problem can be especially costly in areas which have been hitherto blackleg free and thus blackleg may not be promptly brought into a diagnostic differential. Epizootics of blackleg in cattle fed corn silage from trench silos have also been encountered at the Minnesota Veterinary Diagnostic Laboratory, but these cases were from premises with known blackleg histories in recent decades so they were not included in this report. Undoubtedly, excavation alters the disturbed soil in many known and unknown ways with consequent shifts in quantity and quality of its teeming microflora. In addition to the disruption of the soil bacteria's delicate equilibria, excavations for ponds or feeding concentrate animals at certain new sites.

Blackleg, however, does not always require contact with contaminated pasture. In April 1965, a southern Minnesota premise had an outbreak of *C. chauvoei* deaths in a pen of fat stabled young stock, none of which had ever been outside the stable. The pen consisted of 26 bulls, heifers and steers ranging between three and six months of age. The area is not known to be a blackleg area and none of the animals was vaccinated. On the evening of April 12, two of the largest calves in the pen were found dead and a third was

prostrated and terminal. On the following morning, it was noted that the dead calves appeared to have bloated with red froth at their nares and a fourth calf was now unable to rise. Elastrator bands placed on most of the males several weeks previously were suspected, but before the day passed, a heifer calf became prostrated and laboratory diagnosis was requested. Classical lesions of blackleg were present in the heavy muscles of the proximal portions of the pelvic limbs and typical *C. chauvoei* was isolated.

Summary

Three unexpected blackleg outbreaks following soil moving operations are described. The backgrounds suggest that soil disturbances somehow activate latent spores, create conditions necessary for bacillary proliferation, and/or somehow enhance the pathogenicity of hitherto innocuous blackleg bacilli.

Résumé

Les auteurs décrivent trois éruptions imprévues de charbon symptomatique, consécutives au creusage du sol. Les circonstances laissent présumer qu'une telle opération activerait d'une façon quelconque les spores latentes, engendrerait les conditions nécessaires à la prolifération des bacilles, et/ou accentuerait la pathogénicité de bacilles du charbon symptomatique, auparavant inoffensifs.

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